



TFT LCD Approval Specification

MODEL NO.: V201V2 - T03

Customer: _____

Approved by: _____

Note:

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AVP	郭振隆

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**REVISION HISTORY**

Date	Page (New)	Section	Description
Oct. 05,'04	All	All	Preliminary Specification was first issued.
Nov. 01,'04	All	All	Approval Specification was first issued.
	8	3.2.1	Lamp Voltage Typ. : 815 → 840 Lamp Current Min. : 4.0 → 4.2 , Max. : 5.0 → 4.8 Lamp Starting Voltage(Ta = 0 °C) Typ. : 1650→ - , Max. : - → 1730 Lamp Starting Voltage(Ta = 25 °C) Typ. : 1320→ - , Max. : - → 1530
	19	7.2	Contrast Ratio Min. : - → 800 Color Chromaticity : Min. Typ. Max. Rx : 0.616 → 0.622 0.646 → 0.652 0.676 → 0.682 Ry : 0.301 → 0.302 0.331 → 0.332 0.361 → 0.362 Gx : 0.238 → 0.243 0.268 → 0.273 0.298 → 0.303 Gy : 0.573 → 0.568 0.603 → 0.598 0.633 → 0.628 Bx : 0.113 → 0.112 0.143 → 0.142 0.173 → 0.172 By : 0.039 → 0.038 0.069 → 0.068 0.099 → 0.098
Nov.29,'04	12	4.1	Input connector : Hirose FH12-50S-0.5SH→ P-TWO AF7501-N2G1Z
	13	5.1	Connector Part No. : FH12-50S-0.5SH(Hirose)→ AF7501-N2G1Z (P-TWO)
	19	7	Response Time was modified. Notes were modified.
	27	11	The Drawing was modified.
	28	11	The Drawing was modified.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V201V2-T03 is a 20.1" TFT Liquid Crystal Display module with 12-CCFL Backlight unit and 1ch-TTL interface. This module supports 640 x 480 VGA format and can display true 16.7M colors (8-bit/color). The inverter module for backlight is built-in.

1.2 FEATURES

- High brightness (500 nits)
- High contrast ratio (1000:1)
- Fast response time
- High color saturation NTSC 75%
- VGA (640 x 480 pixels) resolution
- DE (Data Enable) only mode
- TTL interface

1.3 APPLICATION

- TFT LCD display

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	408 (H) x 306 (V) (20.1" diagonal)	mm	(1)
Bezel Opening Area	412 (H) x 310 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	640 x R.G.B. x 480	pixel	-
Pixel Pitch(Sub Pixel)	0.2125 (H) x 0.6375 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Display Operation Mode	Transmissive mode / Normally black	-	-
Surface Treatment	Hardness : 3H, Haze : 40% Anti-reflective coating < 2% reflection	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	435.7	436.0	436.4	mm	(1)
	Vertical(V)	329.0	329.3	329.7	mm	
	Depth(D)	-	40.38	41.38	mm	with INV Cover
Weight		-	2200	2300	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	50	°C	(1), (2)
Shock (Non-Operating)	S _{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V _{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ($T_a \leq 40\text{ }^{\circ}\text{C}$).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40\text{ }^{\circ}\text{C}$).

(c) No condensation.

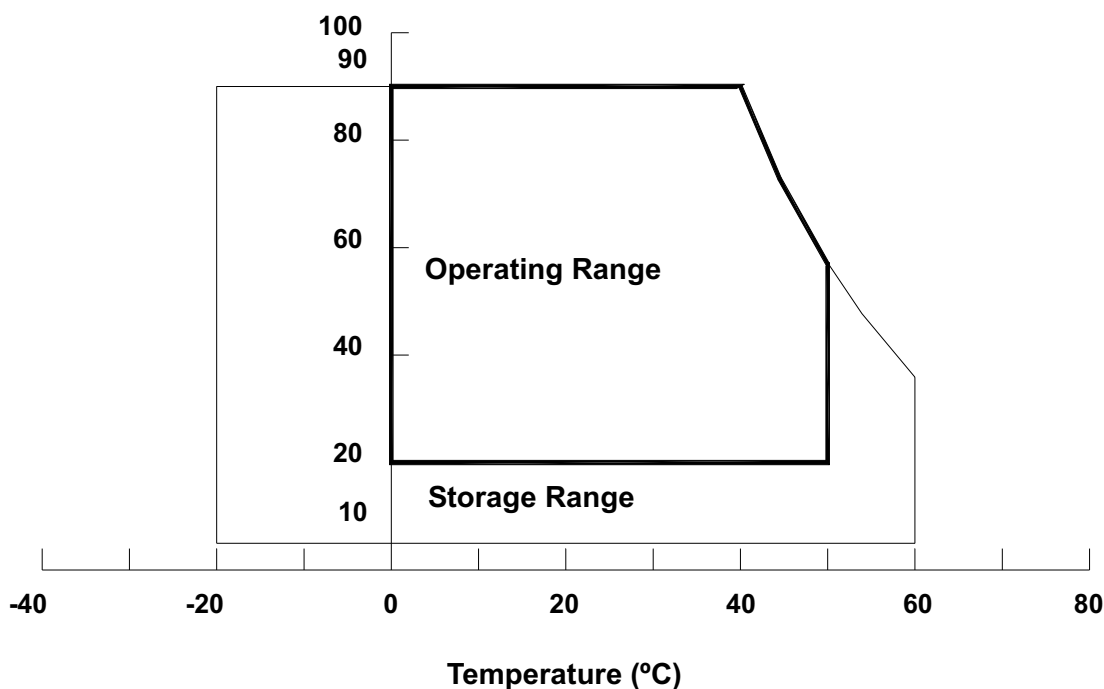
Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 60 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 60 °C. The range of operating temperature may degrade in case of improper thermal management in your product design.

Note (3) 11 ms, half sine wave, 1 time for $\pm X$, $\pm Y$, $\pm Z$.

Note (4) 10 ~ 500 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

Relative Humidity (%RH)



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	+6.0	V	

2.2.2 BACKLIGHT INVERTER UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V _W	—	3000	V _{RMS}	
Power Supply Voltage	V _{BL}	0	30	V	(1)
Control Signal Level	—	-0.3	7	V	(1), (3)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals includes On/Off Control, Internal PWM Control, External PWM Control and Internal/External PWM Selection.

3. ELECTRICAL CHARACTERISTICS

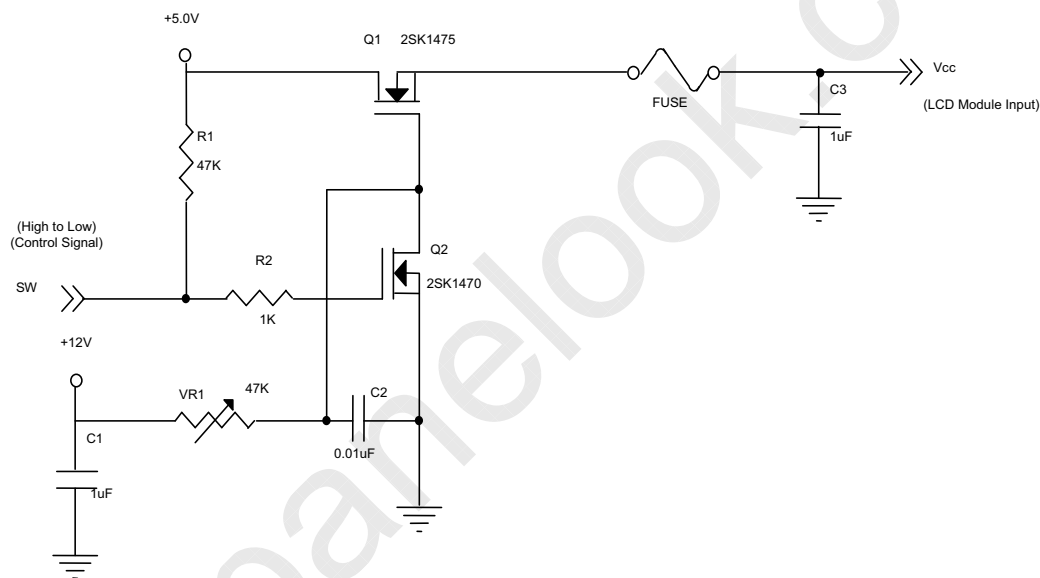
3.1 TFT LCD MODULE

Ta = 25 ± 2 °C

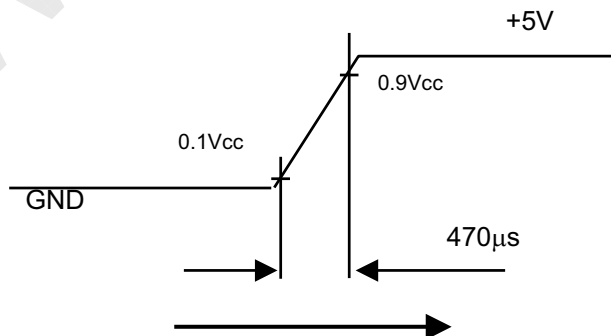
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	4.5	5.0	5.5	V	(1)
Ripple Voltage	V _{RP}	-	-	150	mV	
Rush Current	I _{RUSH}	-	2.0	2.5	A	(2)
Power Supply Current	White	-	0.5	0.6	A	(3)
	Black	-	0.4	-	A	
	Vertical Stripe	-	0.4	0.5	A	
TTL input high threshold voltage	V _{IH}	2.7	-	3.3	V	
TTL input low threshold voltage	V _{IL}	0	-	0.7	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470μs





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Note (3) The specified power supply current is under the conditions at $V_{CC} = 5\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



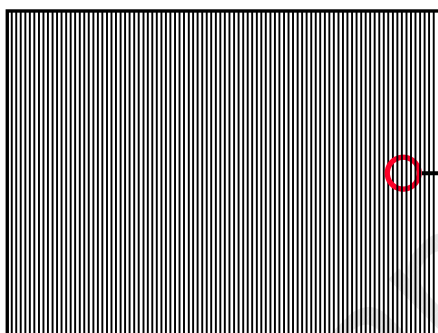
Active Area

b. Black Pattern

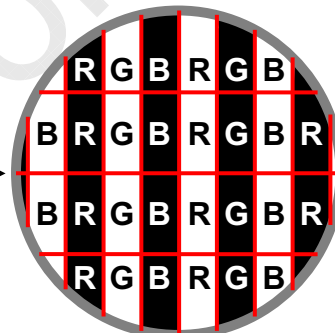


Active Area

c. Vertical Stripe Pattern



Active Area



3.2 BACKLIGHT UNIT

3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS ($T_a = 25 \pm 2\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V_W	-	840	-	V_{RMS}	$I_L = 4.5\text{mA}$
Lamp Current	I_L	4.2	4.5	4.8	mA_{RMS}	(1)
Lamp Starting Voltage	V_S	-	-	1730	V_{RMS}	(2), $T_a = 0\text{ }^{\circ}\text{C}$
		-	-	1530	V_{RMS}	(2), $T_a = 25\text{ }^{\circ}\text{C}$
Operating Frequency	F_O	40	-	70	KHz	(3)
Lamp Life Time	L_{BL}	50,000	60,000	-	Hrs	(4)


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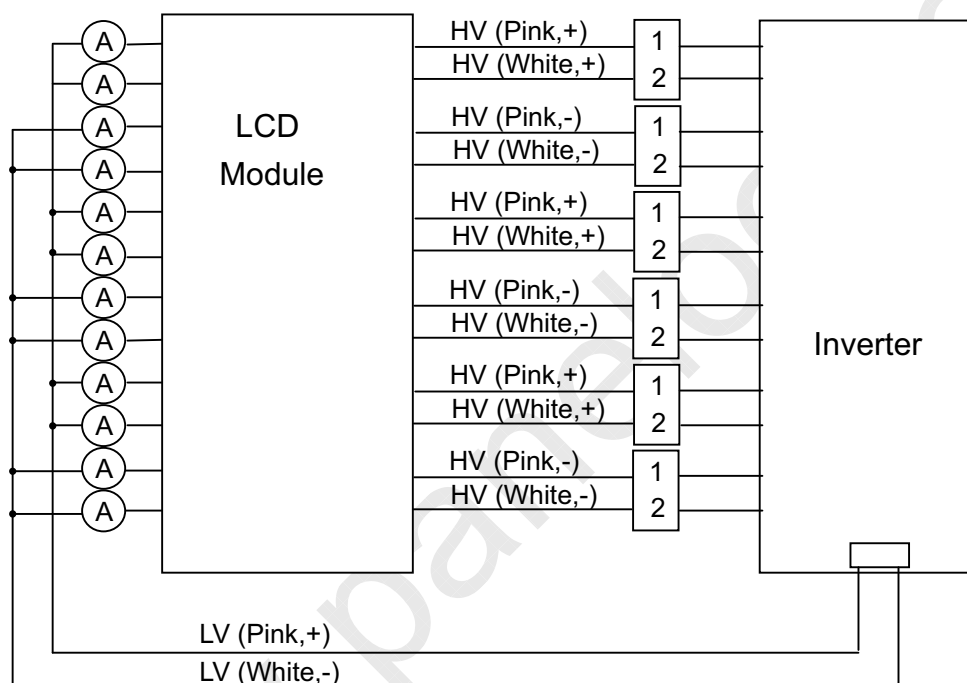
Model No.: V201V2 -T03

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3.2.2 INVERTER CHARACTERISTICS (Ta = 25 ± 2 °C)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P _{BL}	-	50	-	W	(5), I _L = 4.5mA
Power supply Voltage	V _{BL}	18	19	20	V _{DC}	
Power supply Current	I _{BL}	-	2.6	-	A	Non Dimming
Input Ripple Noise	-	-	-	400	mV _{P-P}	VBL=18V
Backlight Turn on Voltage	V _{BS}	1650	-	3000	V _{RMS}	Ta = 0 °C
		1320	-	3000	V _{RMS}	Ta = 25 °C
Oscillating Frequency	F _W	55	58	61	kHz	
Dimming frequency	F _B	150	160	170	Hz	
Minimum Duty Ratio	D _{MIN}	-	10	-	%	

Note (1) Lamp current is measured by utilizing high frequency current meters as shown below:



Note (2) The lamp starting voltage V_S should be applied to the lamp for more than 1 second under starting up duration. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point.) as the time in which it continues to operate under the condition Ta = 25 ± 2 °C and I_L = 4.0 ~ 5.0mA_{RMS}.

Note (5) The power supply capacity should be higher than the total inverter power consumption P_{BL}. Since

the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

3.2.3 INVERTER INTERFACE CHARACTERISTICS

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
On/Off Control Voltage	ON	V_{BLON}	—	2.0	—	5.0	V	
	OFF		—	0	—	0.8	V	
Internal/External PWM Select Voltage	HI	V_{SEL}	—	2.0	—	5.0	V	
	LO		—	0	—	0.8	V	
Internal PWM Control Voltage	MAX	V_{IPWM}	$V_{\text{SEL}} = \text{L}$	—	—	3.0	V	minimum duty ratio
	MIN			—	0	—	V	maximum duty ratio
External PWM Control Voltage	HI	V_{EPWM}	$V_{\text{SEL}} = \text{H}$	2.0	—	5.0	V	duty on
	LO			0	—	0.8	V	duty off
Control Signal Rising Time		T_r	—	—	—	100	ms	
Control Signal Falling Time		T_f	—	—	—	100	ms	
PWM Signal Rising Time		T_{PWMR}	—	—	—	50	us	
PWM Signal Falling Time		T_{PWMF}	—	—	—	50	us	
Input impedance		R_{IN}	—	1	—	—	$\text{M}\Omega$	
BLON Delay Time		T_{on}	—	500	—	—	ms	
BLON Off Time		T_{off}	—	500	—	—	ms	

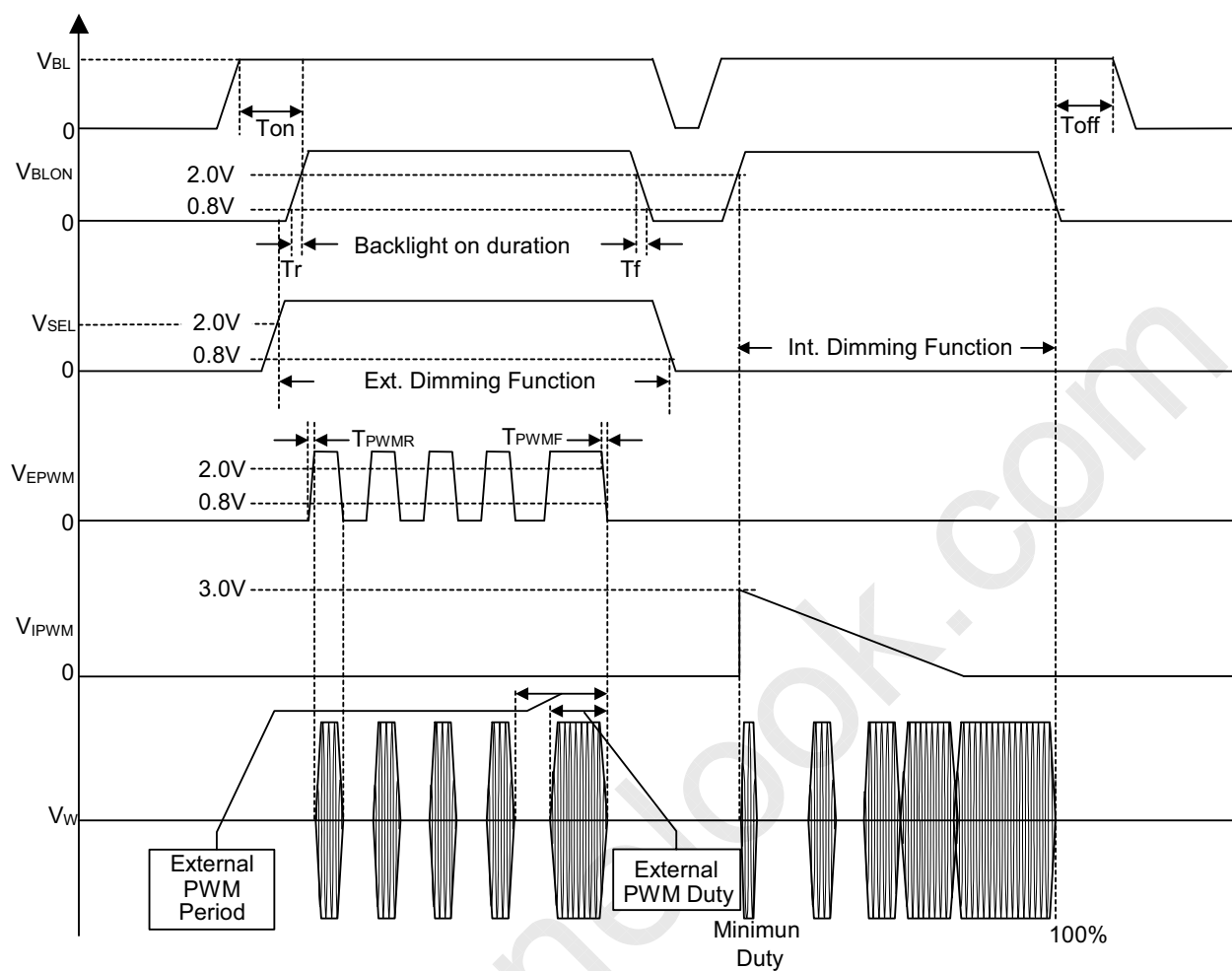
Note (1) The SEL signal should be valid before backlight turns on by BLON signal. It is inhibited to change the internal/external PWM selection (SEL) during backlight turn on period.

Note (2) The power sequence and control signal timing are shown as the following figure.

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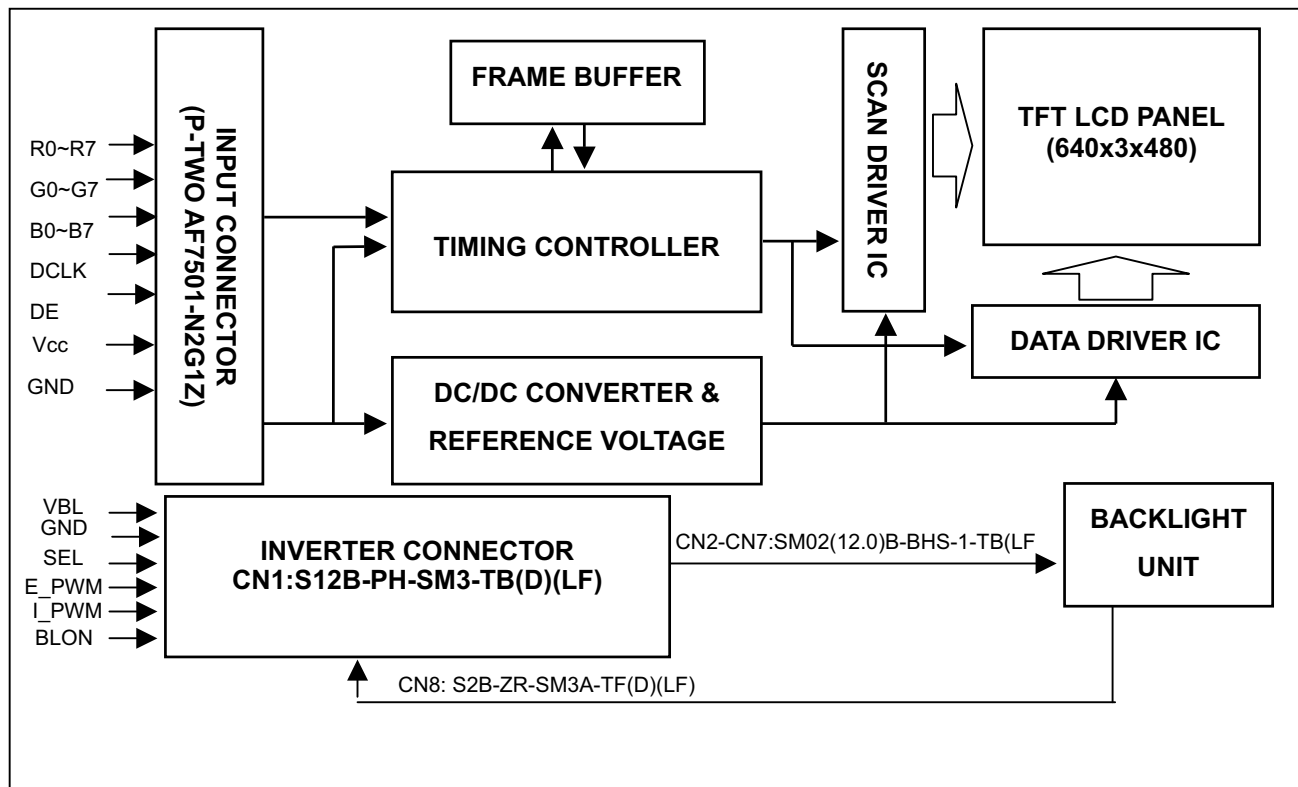
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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INTERFACE PIN CONNECTION

5.1 TFT LCD MODULE

CN1 Connector Pin Assignment

Pin	Name	Description	Pin	Name	Description
1	NC	No Connection	26	R0	Red Data
2	NC	No Connection	27	GND	Ground
3	NC	No Connection	28	G7	Green Data (G7:MSB)
4	GND	Ground	29	G6	
5	GND	Ground	30	G5	
6	VCC	Power Input (+5.0V)	31	G4	
7	VCC		32	GND	Ground
8	VCC		33	G3	Green Data
9	VCC		34	G2	
10	GND	Ground	35	G1	
11	NC		36	G0	
12	NC		37	GND	Ground
13	GND	Ground	38	B7	Blue Data (B7:MSB)
14	DE	Data Enable	39	B6	
15	GND	Ground	40	B5	
16	DCLK	Dot Clock	41	B4	
17	GND	Ground	42	GND	Ground
18	R7	Red Data (R7:MSB)	43	B3	Blue Data
19	R6		44	B2	
20	R5		45	B1	
21	R4		46	B0	
22	GND	Ground	47	GND	Ground
23	R3	Red Data	48	GND	Ground
24	R2		49	NC	No Connection
25	R1		50	NC	No Connection

Note (1) CN1 Connector Part No.: AF7501-N2G1Z (P-TWO) or compatible

Note (2) NC :Reserved for internal use. Left it open.

5.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

5.3 BACKLIGHT UNIT

The pin configuration for the housing and leader wire is shown in the table below.

CN2-CN7(Housing): BHR-04VS-1

Pin No.	Symbol	Description	Wire Color
1	HV	High Voltage	Pink
2	HV	High Voltage	White

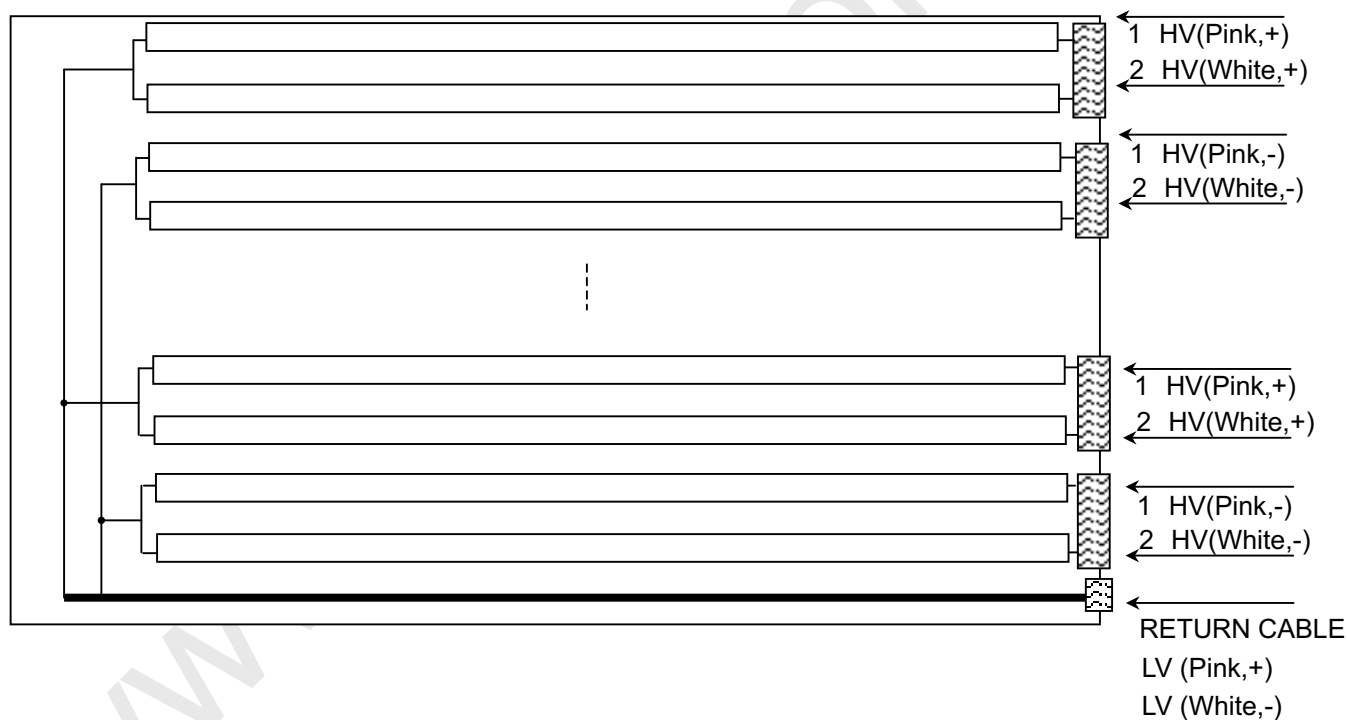
Note (1) The backlight interface housing for high voltage side is a model BHR-04VS-1, manufactured by JST.

The mating header on inverter part number is SM02(12.0)B-BHS-1-TB(LF)(JST).

CN8(Housing): ZHR-2 or equivalent

Pin No	Signal name	Feature	Wire Color
1	LV	Low Voltage(+)	Pink
2	LV	Low Voltage(-)	White

Note (2) The backlight interface housing and return cable for low voltage side is a model ZHR-2, manufactured by JST or equivalent. The mating header on inverter part number is S2B-ZR-SM3A-TF(D)(LF) or equivalent.



5.4 INVERTER UNIT

CN1(Header): S12B-PH-SM3-TB(D)(LF)(JST) or equivalent

Pin No.	Symbol	Description
1	VBL	+19V Power input
2		
3		
4		
5	GND	Ground
6		
7		
8		
9	SEL	Internal/external PWM selection High : external dimming Low : internal dimming
10	E_PWM	External PWM control signal E_PWM should be connected to low when internal PWM was selected (SEL = low).
11	I_PWM	Internal PWM control signal I_PWM should be connected to ground when external PWM was selected (SEL = high).
12	BLON	Backlight on/off control

CN2-CN7(Header):SM02(12.0)B-BHS-1-TB (LF)(JST)

Pin No.	Symbol	Description
1	CCFL HOT	CCFL high voltage
2	CCFL HOT	CCFL high voltage

CN8(Header):S2B-ZR-SM3A-TF(D)(LF)(JST) or equivalent

Pin No.	Symbol	Description
1	CCFL COLD	CCFL low voltage (+)
2	CCFL COLD	CCFL low voltage (-)

Note (1) Floating of any control signal is not allowed.

6. INTERFACE TIMING

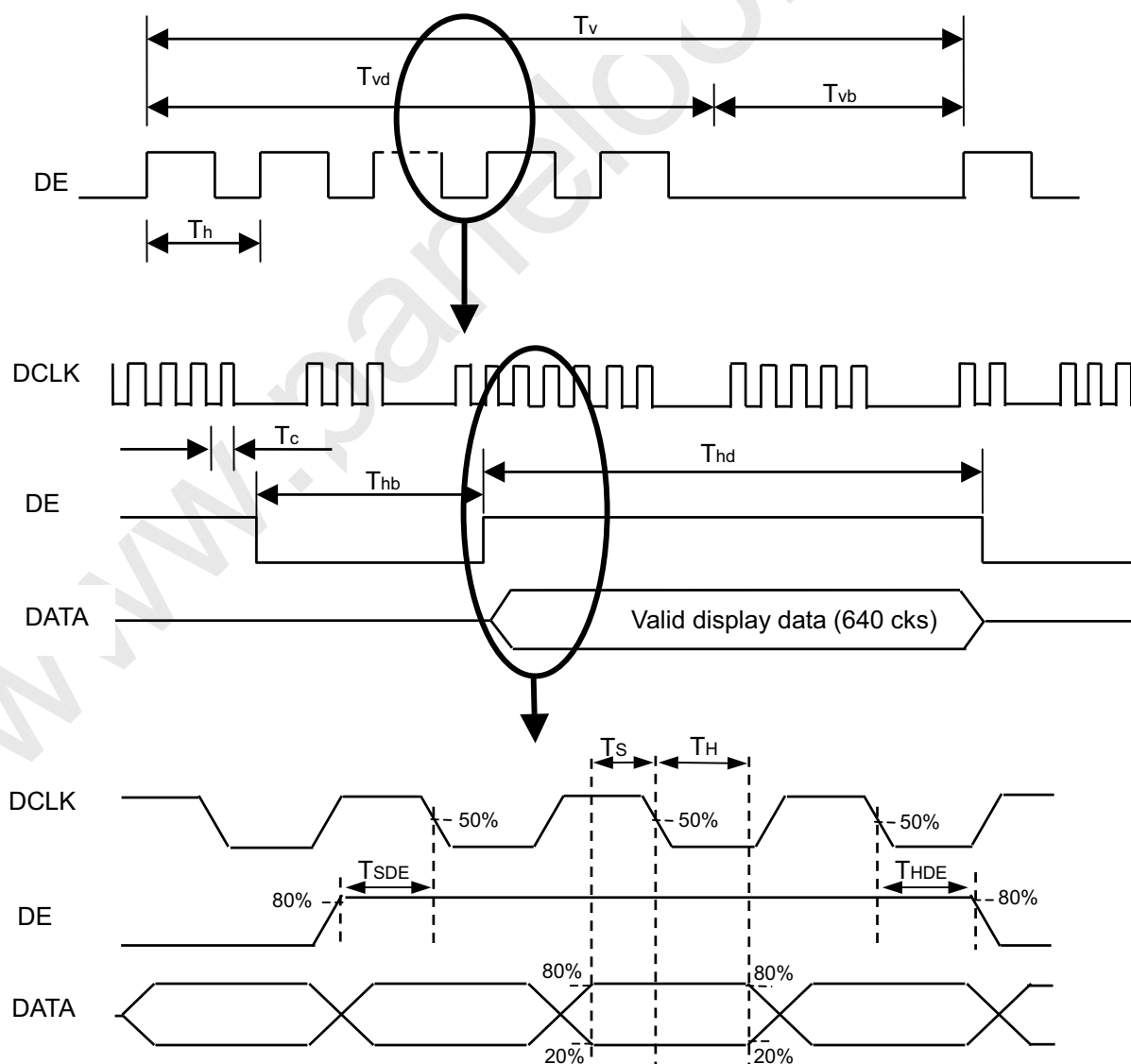
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	1/Tc	20	25.175	30	MHz	-
Vertical Active Display Term	Frame Rate	Fr	47	60	63	Hz	-
	Total	Tv	500	525	550	Th	Tv=Tvd+Tvb
	Display	Tvd	480	480	480	Th	-
	Blank	Tvb	20	45	70	Th	-
	Total	Th	750	800	850	Tc	Th=Thd+Thb
Horizontal Active Display Term	Display	Thd	640	640	640	Tc	-
	Blank	Thb	110	160	210	Tc	-
	Total	Th	750	800	850	Tc	-
Input data Term	Setup time	Ts	15	--	--	ns	
	Hold time	TH	10	--	--	ns	
DE Term	Setup time	TSDE	15	--	--	ns	
	Hold time	THDE	10	--	--	ns	

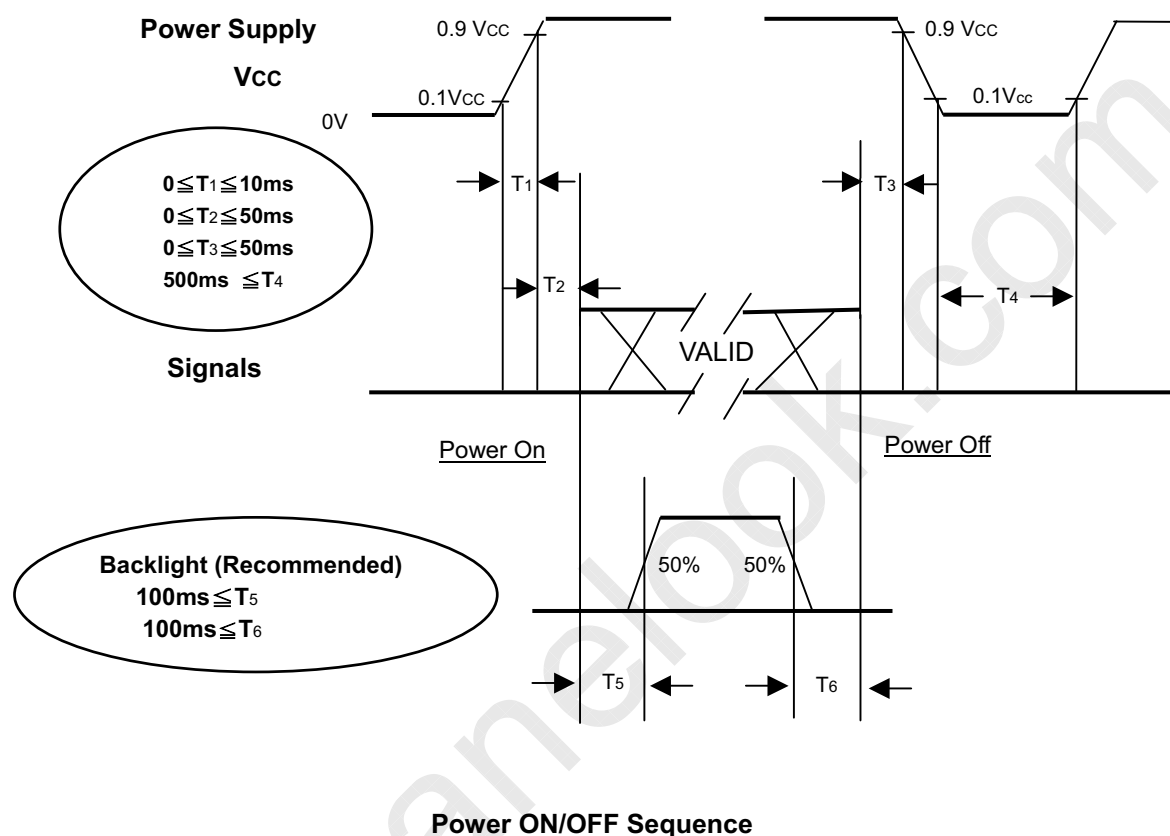
Note: Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I _L	4.5±0.5	mA
Oscillating Frequency (Inverter)	F _W	58±3	KHz

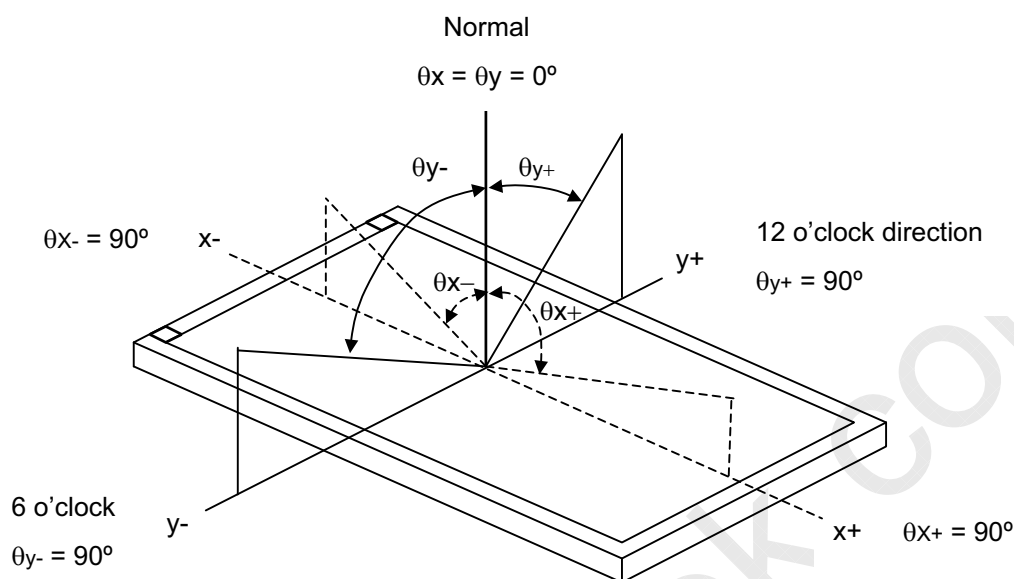
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^{\circ}, \theta_Y=0^{\circ}$ Viewing Normal Angle	800	1000	-	-	Note(2)
Response Time		Gray to gray average			8	12		Note(3)
Center Luminance of White		L _C		400	500	-	cd/m ²	Note(4)
White Variation		δW		-	-	1.25	-	Note(7)
Cross Talk		CT		-	-	4	%	Note(5)
Color Chromaticity	Red	R _x		0.622	0.652	0.682	-	Color Chromaticity
		R _y		0.302	0.332	0.362	-	
	Green	G _x		0.243	0.273	0.303	-	
		G _y		0.568	0.598	0.628	-	
	Blue	B _x		0.112	0.142	0.172	-	
		B _y		0.038	0.068	0.098	-	
	White	W _x		0.251	0.281	0.311	-	
		W _y		0.258	0.288	0.318	-	
	Color Gamut				72	75	-	%
Viewing Angle	Horizontal	θ _x +	CR≥20	80	88	-	Deg.	Note(1)
		θ _x -		80	88	-		
	Vertical	θ _y +		80	88	-		
		θ _y -		80	88	-		

Note (1) Definition of Viewing Angle (θ_x , θ_y):

Viewing angles are measured by Eldim EZ-Contrast 160R



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

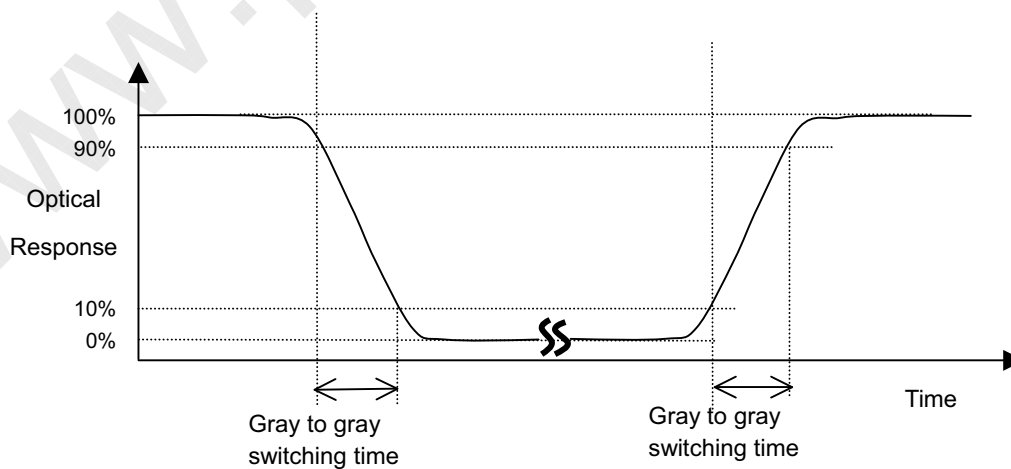
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3) Definition of Gray to Gray Switching Time:





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The driving signal means the signal of gray level 0, 63, 127, 191, 255.

Gray to gray average time means the average switching time of gray level 0, 63, 127, 191, 255 to each other.

Note (4) Definition of Luminance of White (L_C , L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

$$L_C = L(5)$$

$$L_{AVE} = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$$

$L(x)$ is corresponding to the luminance of the point X at the figure in Note (7).

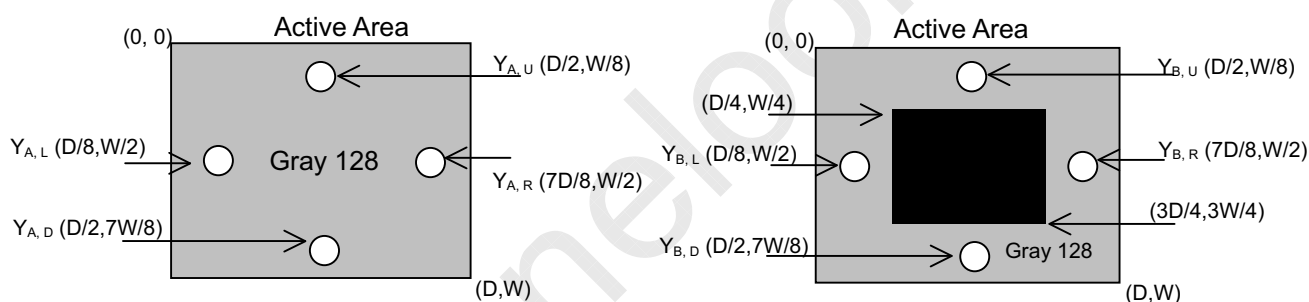
Note (5) Definition of Cross Talk (CT):

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where:

Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)





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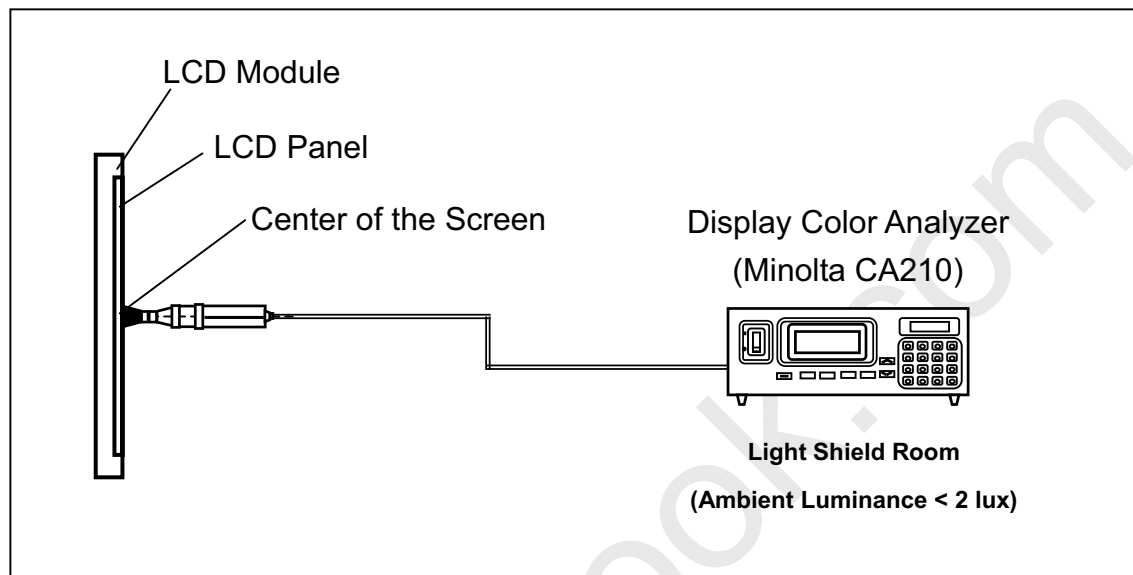
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Note (6) Measurement Setup:

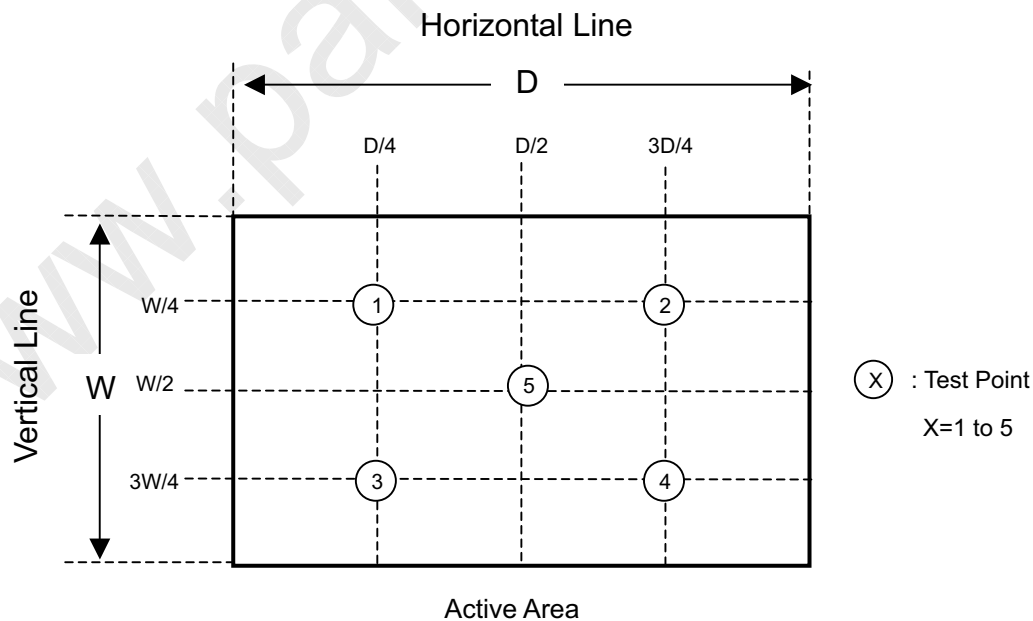
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \text{Maximum} [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum} [L(1), L(2), L(3), L(4), L(5)]$$



8. PACKAGING

8.1 PACKING SPECIFICATIONS

- (1) 5 TV LCD modules / 1 Box
- (2) Box dimensions : 535(L) X 357 (W) X 460 (H)
- (3) Weight : approximately 13Kg (5 modules per box)

8.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

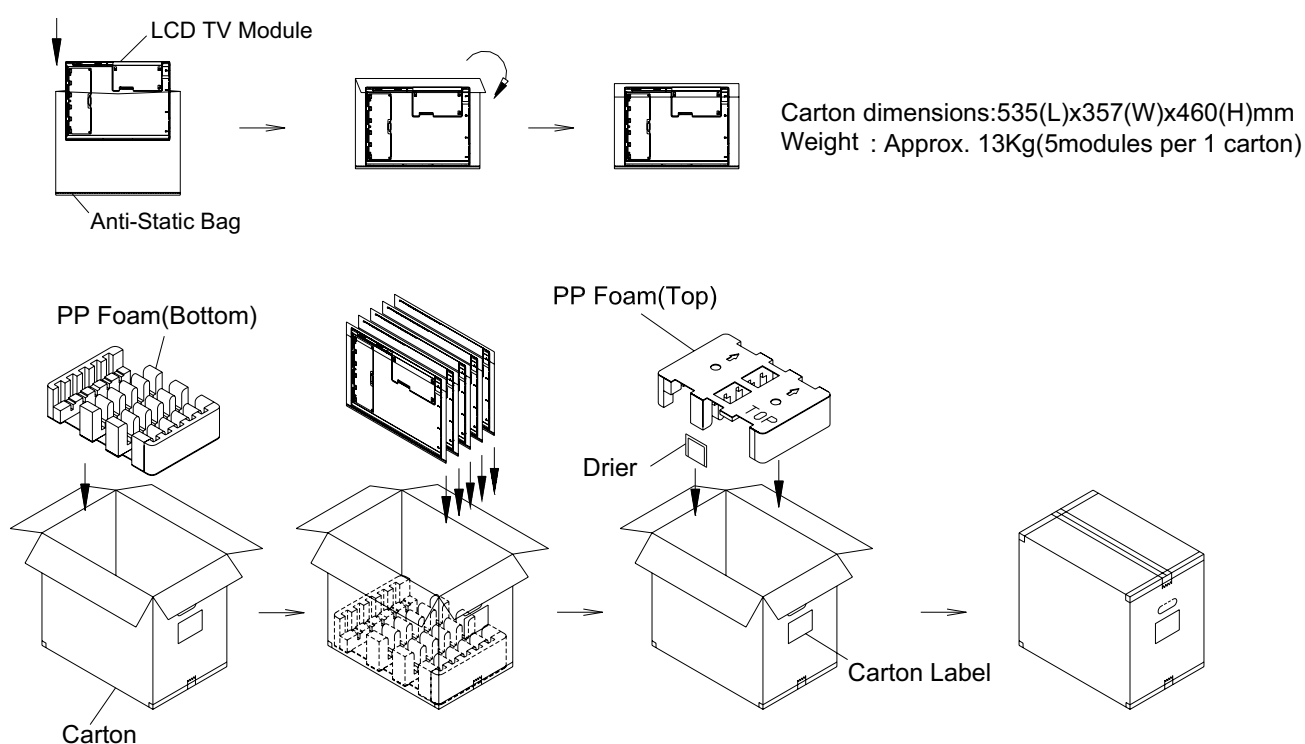


Figure.9-1 packing method



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Corner Protector:L1350*50mm*50mm

Pallet:L1100*W1100*H135mm

Bottom Cap:L1100*W1100*H120mm

Pallet Stack:L1100*W1100*H1515mm

Gross:260kg

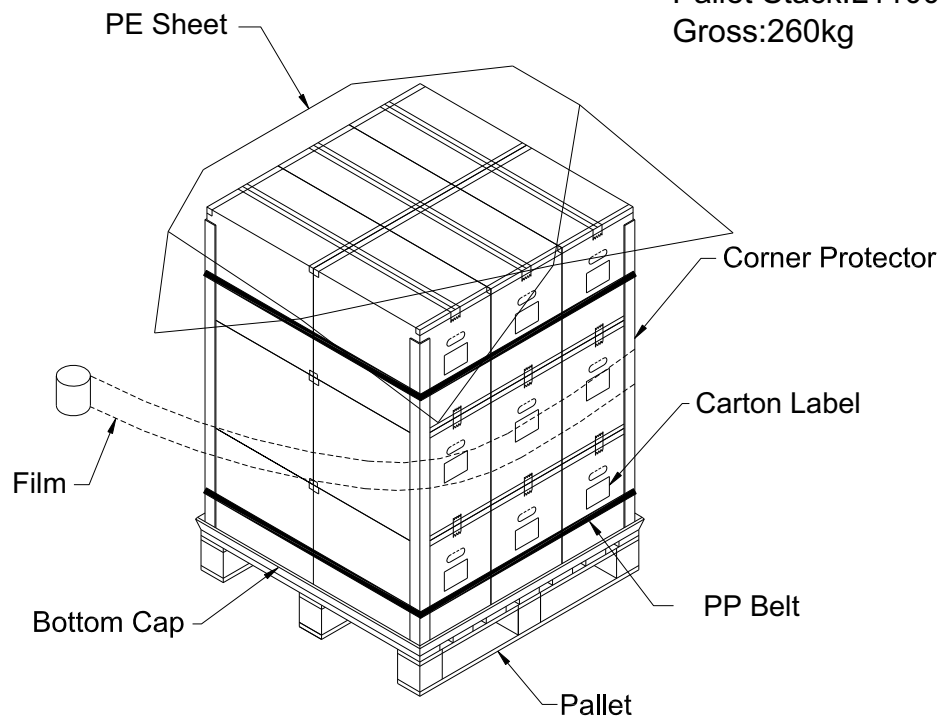
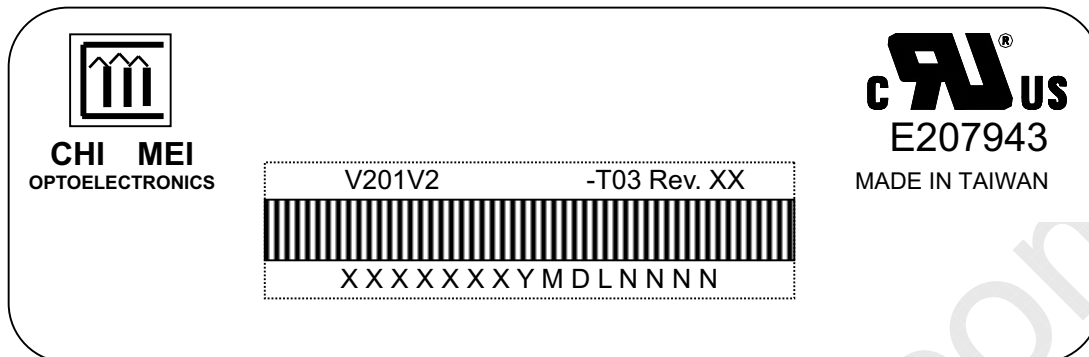


Figure. 9-2 Packing method

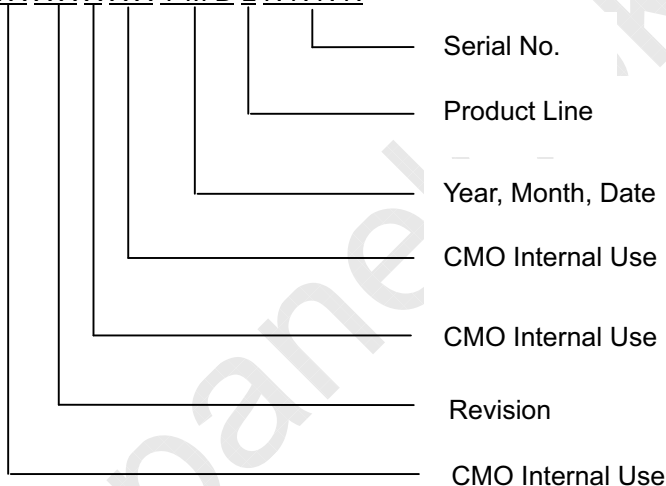
9. DEFINITION OF LABELS

9.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



- (a) Model Name: V201V2 -T03
 (b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.
 (c) Serial ID: XXXXXXYMDLNNNN



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 0~9, for 2000~2009
 Month: 1~9, A~C, for Jan. ~ Dec.
 Day: 1~9, A~Y, for 1st to 31st, exclude I, O, and U.
 (b) Revision Code: Cover all the change
 (c) Serial No.: Manufacturing sequence of product
 (d) Product Line: 1 -> Line1, 2 -> Line 2, ...etc.

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) It is recommended to assemble or to install a module into the user's system in clean working areas.
The dust and oil may cause electrical short or worsen the polarizer.
- (3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- (4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- (5) Do not plug in or pull out the I/F connector while the module is in operation.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) Moisture can easily penetrate into LCD module and may cause the damage during operation.
- (9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.
- (10) When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

10.2 SAFETY PRECAUTIONS

- (1) The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (3) After the module's end of life, it is not harmful in case of normal operation and storage.

10.3 SAFETY REGULATION

- (1) V201V2 is certified with Safety Regulation UL6500. File E240708, Volume 1.
- (2) V201V2 is certified with Safety Regulation IEC 60065. Ref. Certif. No: JPTUV-007772.

**Version 2.1**

